Departmental Colloquium

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Tuesday, September 12, 2017
1:00pm, HH-3017

Bifurcation analysis with symmetry groups

ABSTRACT:

Nonlinear partial differential equations may have distinct solutions. One idea for computing these solutions is to use Newton's method and try different initial guesses. However, these starting points can lie in the same basin of attraction which leads Newton's method to converge to only one solution. In this talk, we will present the approach of Farrell called the deflated continuation algorithm which removes known solutions to a nonlinear PDE by modifying the residual of the problem. The interest of this algorithm is to find several different solutions, starting from the same initial guess.
Then, after talking about classical results on Lie groups, we will extend this algorithm to take into account the symmetry groups of nonlinear PDEs and deflate the whole orbits of solutions. This will allow us to compute solutions to PDEs that lie in different group orbits such as in the Gross-Pitaevskii equation or the two-component nonlinear Schrödinger system.